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# PNAM (Presurgical Nasoalveolar Molding) therapy-first step in preparation of infant for cleft lip and palate repair

Jeni Ann Mathew<sup>1</sup>, Ranjit H Kamble<sup>2</sup>, Pallavi S Daigavane<sup>3</sup>, Ruchika Pandey<sup>1</sup>

## ABSTRACT

A month-old male infant along with parents had reported to Sharad Pawar Dental College. The infant's parents had complained of lip and palate deformity in the child. On examination, it was found that the patient had unilateral cleft lip and palate on the left side. *Objective:* The aim was closure of the defect to prepare the child for surgery with better esthetic results. *Case presentation:* A month-old infant had reported with parents who had been traumatized mentally as the child had lip and palate deformity since birth. They wanted to get it corrected. The child had been advised to undergo PNAM therapy before surgery. *Conclusion:* As a result of PNAM therapy defect was closed to a greater extent from 15 mm to 5mm in lip and palate, to avoid greater tension while surgery.

**Keywords:** Cleft, counselling, compliance, PNAM (presurgical nasoalveolar molding), nasal molding, approximation and nasal stent.

## 1. INTRODUCTION

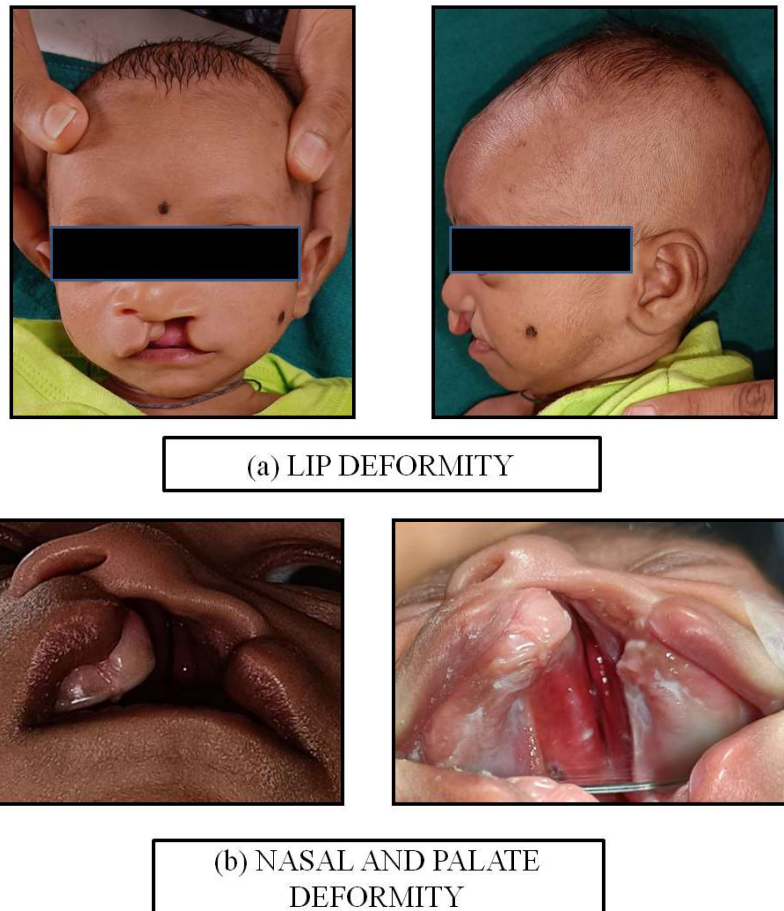
Cleft of the lip, alveolus and palate is the most prevalent congenital deformity. Approximately 27,000 to 33,000 clefts are born in India every year out of the country's 24.5 million births per year (Laxmikanth et al., 2014). Intervention in cleft has been advised within weeks of birth. Matsuo realized that an infant's cartilage is elastic. He hypothesized that the increased hyaluronic acid at the time of birth correlates with the high level of estrogen, which inhibited the cartilage intercellular matrix from being linked. The elasticity of ligaments, cartilage and connective tissue during birth, helps foetus to pass through the birth canal. After birth, the level of estrogen starts to fall (Matsuo and Hirose, 1991).

Infants born with cleft lip and palate can have their alveolus, lip and nose corrected using method developed by Grayson in 1993. Presurgical nasoalveolar molding (PNAM) combines nasal molding with a molding

appliance to treat cleft lip and palate in infants, was created by Grayson and Cutting in 1998 (Grayson and Maull, 2004). It involves the correction of nose morphology and approximation of lip and alveolar segments (Grayson and Maull, 2005). Though from a clinician's perspective, all corrections achieved through PNAM therapy are equally important, from parental perspective lip correction is appreciated most as treatment progresses and can act as a motivation in appliance wear in further period.

## 2. CASE REPORT

A month-old child with parents had reported to Sharad Pawar Dental College with chief complain of poor esthetics. They wanted correction of lip and palate deformity.



**Figure 1** Pre-treatment photograph of infant (a) Lip deformity (b) Nasal and palate deformity

General examination of child was done by the paediatrician to rule out any syndromic condition. Extraoral examination revealed cleft of the lip on the left side of 15mm (Figure 1a). Intraoral examination revealed a deformity in the palate with two ridges at a distance of 15mm (Figure 1b). After assessments, PNAM therapy was advised. The treatment protocol we followed had 3 aspects firstly parental counselling to maintain morale and understanding of deformity and its management, second PNAM therapy and third diet counselling for weight gain for surgery at recommended age. Counselling of parents and family was done in every appointment to maintain the morale and compliance.

In the second appointment post preliminary evaluation of putty impression of the child was taken in the department of oral surgery to prevent time lapse in access to necessary medical support and equipments if there is even a rarest incidence of impression material moving to the airway while taking an impression. Cast was poured and after blocking out the deformity and undercut, the plate was fabricated. In the third appointment, the child with parents was recalled for delivery of appliance. The procedure for PNAM therapy was explained to the patient and family members and advised regarding full-time wear and hygiene, cleaning of appliance daily using brush and water having normal temperature. Base tape change was recommended in 2-3 days and elastic and tape assembly to direct force was changed daily. Step 1 was lip taping. Step 2 involved the placement of base tapes on the cheek. Step 3 involved the placement of tray with handle in the oral cavity. Step 4 involved sticking tapes with elastic arising

from the handle at an angle of forty-five degrees directed upward (Figure 2). After the patient was explained regarding procedure patient was asked to redo how the plate is placed in the child. Post appliance delivery an evaluation appointment was scheduled in upcoming working day to check any discomfort in child or parents who may have any doubts about appliance use, it was scheduled as part of protocol to ensure appliance insertion efficiency of parents (Grayson and Shetye, 2009; Suri, 2009; Shetye and Grayson, 2017).



**Figure 2** Appliance placed in infant

The interval between appointments was 1 week. Evaluation was done in steps. Step 1 involved evaluation of weight and encouragement to gain weight to recommended weight for subsequent surgery and evaluation by a paediatrician to ensure general well-being. Step 2 parents were asked whether child had worn the appliance as recommended. Step 3 the parent was asked to demonstrate the procedure of plate placement. Step 4 photographs were taken to check the movement of ridges. Step 5 if evaluation revealed movement, plate was selectively trimmed and smoothened for further movement. In the plate, selective trimming was done to achieve movement of the larger segment towards the smaller segment (Shetye and Grayson, 2017).



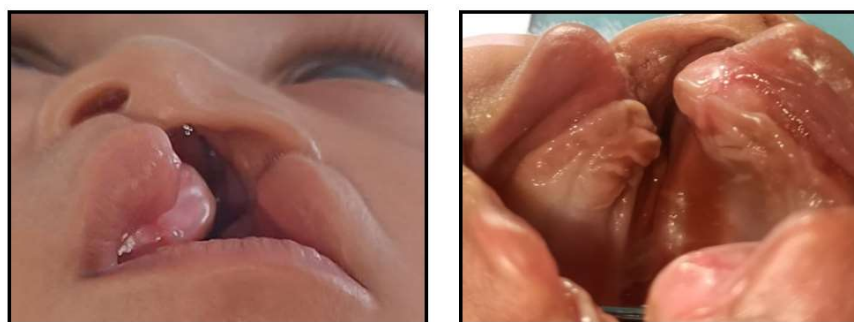
**Figure 3** Appliance with nasal stent placed in infant

In subsequent appointment step 1-5 was followed up to three and half month of age according to need and the patient had reported weekly. Extraoral examination revealed reduction of cleft of lip on the left side to 5mm. Intra oral examination revealed reduction in deformity in palate distance was 5mm. When fragment was closer by 5 mm, nasal stent was added to plate. Guideline for checking the efficiency of nasal stent is mild amount of stretch is seen at medial tip as depicted (Figure 3). Selective addition of acrylic was done for nasal molding in further appointments to maintain the stretch up to four and half month to achieve proper nostril morphology (Shetye and Grayson, 2017).

After achieving the maximum results in the time frame as depicted (Figure 5), the patient was referred to the department of oral surgery for repair of lip and palate.



(a) LIP DEFORMITY



(b) NASAL AND PALATE DEFORMITY

**Figure 4** Post-treatment photograph of child (a) Lip deformity (b) Nasal and palate deformity

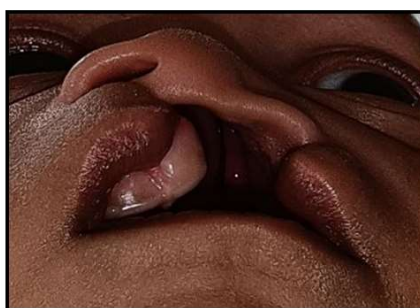


PRE TREATMENT



POST TREATMENT

(a) LIP DEFORMITY



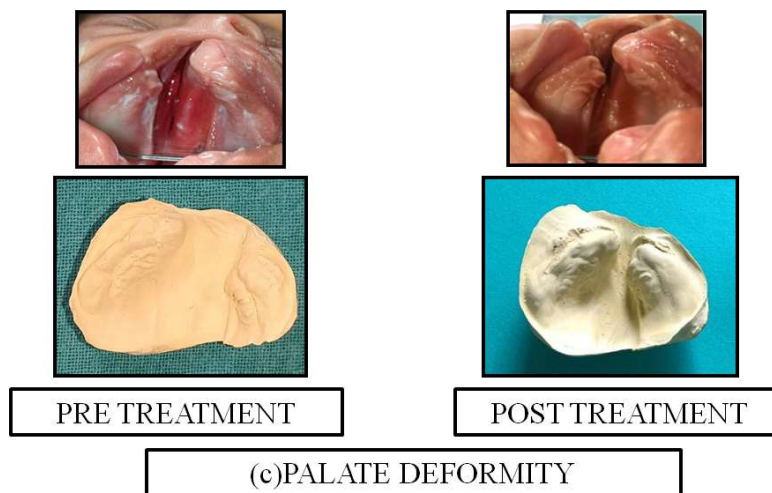
PRE TREATMENT



POST TREATMENT

(b) NASAL AND PALATE DEFORMITY





**Figure 5** Comparison of pre-treatment with post treatment (a) Lip deformity (b) Nasal and palate deformity (c) Palate deformity

### 3. DISCUSSION

The aim of PNAM therapy in unilateral cleft lip and palate (UCLP) patients was reduction of deformity of the lip and palate to provide better surgical results. The basis of PNAM therapy was the utilization of light pressure to aid the approximation of segments. Lip taping and nasal molding provided a force that helped the movement of the larger segment towards smaller segment and reduced gap (Grayson and Shetye, 2009; Suri, 2009; Shetye and Grayson, 2017).

The importance of PNAM therapy has been supported by studies quoted in the literature, 60% of patients had no secondary requirement of secondary graft when the patient had undergone PNAM therapy and gingivaperioplasty (GPP) and 40% of patients had a lesser need for graft (Santiago et al., 1998; Sato et al., 2002). Reducing the number of surgeries could lessen the economic pressure. Improved morale of parents and family members of child who had undergone PNAM therapy had also been seen as it improved the facial esthetics which is the highest concern among caregivers as was also seen in similar cases (Sischo et al., 2016). When researchers evaluated the alveolar region, found significant decrease in the gap between ridges post-PNAM as also has been found in our patient (Sabarinath et al., 2010).

From parental point of view, it is financial challenge as well as time invested which effects compliance of family to treatment as most of the time two people accompany the child to centre. The challenge in PNAM therapy is having an expert counsellor as part of the team to ensure the compliance of patients with treatment mainly regarding appliance wear and regular visits. Vigilant care of orthodontist and oral surgeon is recommended during the procedure of impression taking to prevent and in rarest case manage mishap of aspiration of impression material if occurs accidentally. A regular visit to a Paediatrician is a mandatory routine followed to ensure the health of the infant to achieve the recommended weight in preparation for surgery. Dieticians need to monitor the diet of the mother also to ensure she can adequately care for the needs of infant.

Complications associated with PNAM therapy are redness in the cheek if base tapes are removed vigorously. To ensure ease in the removal of tapes, it needs to be dampened during removal and post-removal skin needs to be dried and moisturized as a part of skincare. If a moistened area is left unattended there is a chance of tissue fungal infection. In cases of regurgitation of milk by child, they need to be eased and then gradually plate needs to be removed during cleaning of the face and tapes need to be replaced if they are dampened and skin care should be followed mandatorily. In case of ridge ulceration, plate use should be stopped until it heals. In case of cheek ulceration, the base tape location should be altered ensuring proper angulation of tape arising from the plate handle (Batra et al., 2022).

After PNAM therapy improvement in nasal morphology and the ridge approximation was evident. Lip correction was proven to have long term stable results as is quoted in literature (Niranjane et al., 2014). PNAM therapy requires team effort of paediatrician, orthodontist, counsellor, social worker and parents in preparing the infant in optimum way for better surgical results and better well-being.

## 4. CONCLUSION

The psychological state of parents is uplifted with successful PNAM therapy. A properly done PNAM therapy can decrease the number of surgery and their economic stress. The better results of PNAM therapy can build compliance for further treatment at various ages and their esthetic results.

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## Author Contributions

All authors have contributed equally in manuscript work and production.

## Informed Consent

Written and oral informed consent was obtained from the patient's parent in this study.

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## Conflict of interest

The authors declare that there is no conflict of interests.

## Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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